

Elementary Education Network Newsletter



This newsletter addresses the curriculum and instruction component of *Elementary Makes the Grade!* with a specific focus on mathematics. In the last few years we have emphasized literacy instruction in California. Now, with the new standards-based mathematics materials adopted by the California State Board of Education, we are encouraging schools to target mathematics. Every student can achieve mathematical competence and every student is entitled to a solid foundation in mathematics beginning as early as preschool. This newsletter includes research on mathematics instruction for young children and the characteristics of an effective elementary school mathematics program as well as additional resources and Web sites.

We had a successful *School's In!* Preconference in August with a keynote address by James Stigler. We invite you to check our Web site at <www.cde.ca.gov/elementary> for the Study Guide to *The Teaching Gap* (Stigler & Hiebert) which compares math teaching practices in Japan and Germany with those in the United States. This newsletter also features Rio Calaveras Elementary School as a school that is implementing best practices in mathematics instruction.

Barbara Baseggio, Manager
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What's New at the Elementary Education Network Web Site

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The Elementary Education Network's venue of electronic resources is expanding. New at the site is the *Elementary Makes the Grade! Executive Summary*, a **Study Guide** for use with *The Teaching Gap*, and an article summarized in this newsletter that is recommended reading for preschool educators.

The *Elementary Makes the Grade! Executive Summary* presents the original publication's five components and fifteen recommendations and the rationale for each of the recommendations.

The *Study Guide for the Teaching Gap* was developed by the Elementary Education Office to be used as a tool to assist educators in discussing *The Teaching Gap* (Stigler, James W., and James Hiebert, 1999), and its implications for standards-based education.

These resources and the Baroody article summarized in the "Summary of Research on Early Childhood Mathematics" can be accessed at the Elementary Education Network Web Site <www.cde.ca.gov/elementary>. ■

Characteristics of an Effective Elementary School Mathematics Program

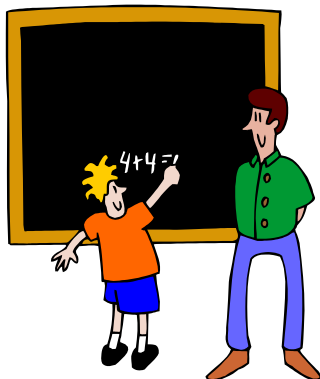
An effective elementary school mathematics program begins with, and is built upon, the *Mathematics Framework for California Public Schools, Kindergarten Through Grade Twelve* (CDE, 1999). The framework helps educators plan a mathematics program that enables students in grades kindergarten through seven to be fully prepared for higher level mathematics starting in grade eight.

Early childhood educators realize that children's day-to-day experiences **prior to** kindergarten play a major role in their development of mathematics concepts. It is recommended educators of young children should be provided opportunities to learn mathematics by ages three and four.

The quality of instruction is the single most important component of an effective mathematics program. Teachers need to possess an in-depth understanding of the content standards and the mathematics they are expected to teach. Teachers also need to use research-based instructional strategies that are appropriate to the instructional goals and students' needs.

A balanced mathematics program includes the following areas:

- **Basic computational and procedural skills** need to be learned for each level of mathematics.
- **Conceptual understanding** teaches students how to apply skills as well as when and why. For example, primary grade students should understand that one way of thinking about multiplication is as repeated addition.



- **Problem solving** involves applying skills, understandings, and experiences to resolve new or challenging mathematical situations.

The Mathematics Framework recommends that students have 50 to 60 minutes of mathematics instruction daily not including homework. Homework should be used to extend learning time. The key standards represent critical knowledge that needs to be emphasized in kindergarten through seventh grade. These key standards are emphasized in the Stanford 9 and the California Standards Test in Mathematics. Students should be assessed frequently to determine whether they are progressing steadily toward achieving the standards; and the results of assessment need to be used to modify instruction.

All teachers need high quality instructional materials, but new teachers especially depend on well-designed resources and materials that are aligned with the standards. These resources must address basic computational and procedural skills, conceptual understanding, and problem solving and stress the interdependency of all three areas. The new state-adopted mathematics materials cover the content of the standards, but teachers need to ensure that students have the conceptual understanding and mathematical reasoning needed to solve problems.

Professional development for teachers needs to focus on proficiency in mathematics and pedagogical tools that will help teachers ensure that all students meet grade-level standards. Many teachers have never been taught the conceptual understanding of why they are doing mathematical procedures. Thus it is critical that they receive professional development that deepens their understanding of math concepts and reasoning.

In addition, effective mathematics programs have strong administrative support and community involvement so that all students achieve mathematics standards. ■

Summary of Research on Early Childhood Mathematics

Young children need appropriate mathematics education. California Department of Education documents, *First Class: A Guide for Early Primary Education* (1999) and the *Prekindergarten Learning and Development Guidelines* (2000), offer guidance on appropriate mathematics instruction for young children. The Association for Supervision and Curriculum Development's (ASCD) *Curriculum Update* "Math in the Early Grades," and Arthur Baroody's article, "Does Mathematics Instruction for Three- to Five-Year-Olds Really Make Sense?", provide additional information regarding research-based strategies for mathematics instruction. The authors stress the importance of giving preschoolers and kindergartners opportunities to reason, problem-solve, and develop a concrete understanding of numbers and other mathematics concepts.

ASCD states that educators of young children should:

- Start providing opportunities for mathematics by ages three and four.
- Make sure that children have a conceptual understanding of number before using symbols.
- Emphasize play to build understanding and practice newly acquired mathematics skills.
- Use manipulatives to "cement" understanding of number, geometry, measurement, and pattern.
- Pose problems that enable children to predict, measure, reason, and communicate their solutions.
- Help families to emphasize children's discovery of mathematics concepts.

Baroody reviews recent research that supports young children's mathematical competence. One of the areas of research discussed by Baroody is shown below:

Informal concept of numerical equivalence.

Children as young as three can recognize equivalence between small collections of 1 to 4 objects or pictures. They can recognize that ■■■■ and ■■ are the same, while ■■■■ and ■■ are not.

Four-year olds can compare two collections of different items and recognize *the same number-name principle*, i.e. the two collections are equal if

they share the same number name, despite differences in physical appearances. Five-year-olds can typically name the number after another up to 10 and mentally compare two numbers to determine the larger or smaller number.

Given the research on development of mathematics concepts, how should early childhood mathematics be taught? Baroody strongly recommends an investigative approach consisting of three components:

- **Positive disposition to learn and use mathematics.** Teachers and families help children develop the belief that everyone is capable of understanding mathematics and solving mathematical problems.
- **Understanding mathematics.** Teachers and families help children relate school-taught symbols and procedures to their everyday lives, consider how different concepts are related (such as addition and subtraction), and learn the "whys" and "hows" of mathematics.
- **Engage in mathematical inquiry.** Teachers and families help children make and test conjectures, find patterns in their own lives, solve problems, and reason. They also encourage young children to communicate their growing understandings about mathematics through drawings, words, and print.

Baroody suggests specific ways for early childhood educators to foster mathematical power through purposeful, meaningful, and inquiry-based instruction.

1. Purposeful instruction uses everyday situations, children's questions, games, and literature. The teacher builds on what the children know to learn new concepts. For example, a preschooler asks his teacher how old he will be after his next birthday. Rather than simply giving him the answer, the teacher poses the question to his classmates, "Here is an interesting question. If you are three years old now, how can you figure out how old you will be

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on your next birthday?" The students discuss ideas, such as clapping out numbers in order, counting on the number line, or looking at the birthday chart for someone who used to be three. The teacher may follow up with another question. "If you are four, and your friend is five, how can we figure out who is older?"

2. Meaningful instruction promotes children's informal mathematical knowledge and helps them see patterns and relationships. For example, a puppet might count "thirteen, fourteen, fifteen" and the preschoolers would laughingly point out its error.
3. Inquiry-based instruction helps children by offering worthwhile tasks or questions, encouraging their reflection rather than the teacher's answer, and eliciting peer dialogue. Kindergartners and first graders might have two or three homework problems to illustrate their thought processes along with their solutions. For example, "There are six children at our table. How many eyes are there?"

Preschoolers are capable of understanding mathematical concepts long before school. It is important for preschool educators to use research-based strategies to enhance the achievement of young children in mathematics. ■

Sources:

Baroody, Arthur J. July, 2000. "Does Mathematics Instruction for Three- to Five-Year-Olds Really Make Sense?" *Young Children*, Vol. 55, No. 4, pp. 61-67. <www.cde.ca.gov/elementary/matharticle.pdf>

Checkley, Kathy. Summer 1999. "Math in the Early Grades: Laying a Foundation for Later Learning," Association for Supervision and Curriculum Development, *Curriculum Update*.

Web Site Support to Help With New State-Adopted Math Textbooks

The Sacramento County Office of Education has developed a web site that is designed to answer your questions about the new state-adopted mathematics materials. You can submit your questions to this web site at <www.scoe.net/elementary> and see the answers to questions others have posed. The web site is designed to support successful implementation of the new state-adopted mathematics materials for kindergarten through eighth grade. ■

Mathematics Resources and Web Sites

- ◆ The California Department of Education Web site contains California's K-12 content standards in mathematics, reading-language arts, history-social science, science, and visual and performing arts at <www.cde.ca.gov/board>.
- ◆ The California Mathematics Framework and the Mathematics Instructional Materials Adoption Report are available at <www.cde.ca.gov/cfir>.
- ◆ The National Council of Teachers of Mathematics (NCTM) Web site at <www.nctm.org> includes a variety of resources on mathematics including the article, *Mathematics in the Preschool*, at <www.nctm.org/tcm/2001/01/p270.htm>.
- ◆ The Head Start Child Outcomes Framework, which includes several outcomes related to mathematical concepts and skills, is available at <www.headstartinfo.org/publications/pdf/im00/im00_18a.pdf>.
- ◆ The Eisenhower National Clearinghouse for Mathematics and Science Education Web site contains curriculum resources, web links, and the *Focus Magazine* link. <www.enc.org/classroom/index>.
- ◆ California Math Council's Web site contains publications, online resources, and discussion groups. <www.cmc-math.org>.
- ◆ The California Math Project Web site contains information on professional development activities, lesson study, and information on the California standards and frameworks. <csmp.ucop.edu>.
- ◆ The Private Universe Project in Mathematics airs regularly on the Annenberg/CPB Channel (a free digital satellite channel available to schools and communities across the county). The project includes a one-hour PBS documentary, a series of six K-12 teacher video workshops, and a companion interactive web site. Additional information is available at <www.learner.org/channel/workshops/pupmath>. ■

Resources for Working with Parents and Families on Mathematics

There are a number of resources for parents, classroom teachers, early childhood educators, and after-school program providers to use to help children learn mathematics.

The Lawrence Hall of Science has developed a Family Math program that focuses on families learning mathematics together. Family Math classes give parents an overview of the math topics covered at various grade levels and explanations of how Family Math activities fit in. Topics covered include algebra, estimation, logic, geometry, and measurement. Family Math focuses on developing problem-solving skills and building conceptual understanding of mathematics with hands-on materials.

In Family Math classes, children and adults come together once a week for four to six weeks, doing most activities in small groups with two or three families working together. They then put into practice, at home, the ideas they have developed in class. The Lawrence Hall of Science provides Family Math Class Leader workshops that prepare educators, parents, and others to lead classes for families. These two-day workshops include materials, methods, and strategies for leading Family Math classes. Family Math maintains an active network to provide support to class leaders, staff developers, parents, and teachers interested in Family Math.

A Family Math guidebook, *Family Math for Young Children: Comparing*, has been developed for parents of children in pre-kindergarten through third grade. This guidebook includes information on how

parents can be more involved at school and how to help young children at home. The *Family Math* guidebook covers kindergarten through eighth grade and *Family Math—The Middle School Years, Algebraic Reasoning and Number Sense*, targets grades 5 through 8.

The Family Math books are available in English, Spanish, and Chinese and provide full instructions and activities for families to do at home or in class, as well as information on how to set up a Family Math course. For more information on the Family Math program, see the web site at lhs.berkeley.edu/equals/FMnetwork.htm or call Helen Raymond at (510) 643-6525.

The United States Department of Education has also developed activities to help families explore math. *Helping Your Child Learn Math* provides activities for families with children in kindergarten through fifth grade. Activities are arranged by level of difficulty and suggested grade levels. This document is available on the Internet at www.ed.gov/pubs/parents/Math/index.html.

Early Childhood: Where Learning Begins, Mathematics is designed to help parents of preschool children use home activities to challenge their children's thinking. In addition to building mathematics skills, these real-life activities help children develop language as they ask questions, develop fine motor skills as they manipulate objects, and improve social skills as they work with their parents or others on a problem. This document is available by calling 1-877-4ED-Pubs. ■



BEST PRACTICES SCHOOL

Rio Calaveras Elementary School

Rio Calaveras School in Stockton City Unified School District is a high performing school that exemplifies best practices in mathematics. Rio Calaveras, a large, multi-track, year-round school, serves a diverse student population. Of the 734 students, 21 percent are English language learners and 58 percent qualify for free or reduced-price lunch.

Reading and mathematics are the highest priorities at Rio Calaveras School. Most classes use a combination of Saxon Math and Harcourt Math textbooks with Math Matters techniques. (To learn more about Math Matters, go to www.edserv.sjcoe.k12.ca.us/mm/.) Teachers use high quality instructional materials that are aligned with standards and use research-based instructional strategies that are appropriate to the instructional goals and students' needs. Resources address basic computation and procedural skills, conceptual understanding, and problem solving and emphasize the interdependency of all three areas. Grade-level math standards are posted in each classroom, as well as posters with Math Matters techniques. During the majority of the mathematics instruction, students are active participants in the instruction—engaged in thinking about or doing mathematics.

Rio Calaveras has experienced significant population growth over the last two years, and the majority of its teachers are not fully credentialed. Of its 42 teachers, 12 have permanent status. Emergency credentialed teachers are enrolled in Project IMPACT to complete their credential. Project IMPACT is a two-year district intern program sponsored by a consortium of local districts and coordinated by San Joaquin County Office of Education. Project IMPACT incorporates the following components to help beginning teachers:

- *coaching*—intensified coaching from Practicum supervisors (approximately 20 visits year one, and ten visits year two). Interns receive support from an on-site coach.
- *ongoing professional staff development*—coursework and seminars.

In addition to Project IMPACT, first-year teachers are required to go to seven days of Math Matters training during the summer and three full days for all teachers throughout the year

during the school year. The training consists of math content strategies, cognitive coaching, and classroom management techniques (which can be applied to all curricular areas), as well as instruction on how to better reach a balanced math lesson including conceptual, procedural, and mathematical reasoning. Math Matters increases the mathematical content knowledge of teachers and this increased knowledge manifests itself by increasing confidence and enthusiasm related to their teaching of their students. Math Matters' training includes the following components:

- *coaching*—which provides help to teachers with content and classroom management techniques. When the coaches are in the classroom, they are either watching the teacher in order to strengthen teaching techniques or modeling a math lesson. Teachers have the opportunity to interact with students and staff developers during in-class reflective coaching sessions.
- *staff development*—designed to ensure that teachers continue to develop skills and knowledge in mathematics content

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Rio Calaveras Elementary School (K-6)
Stockton Unified School District
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<nmettler@stockton.k12.ca.us>

Enrollment:	734
Hispanic:	28%
Asian:	25%
African American:	16%
White:	14%
Other:	3%
English Language Learners:	21%
Free/Reduced Price Lunch:	58%
Fully Credentialed Teachers:	70%
2000 API:	717
Statewide Rank:	7
Similar Schools Rank:	10

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and instructional options. Teacher training focuses on enhancing teachers' proficiency in mathematics; and providing pedagogical tools that help teachers to ensure that all students meet grade-level standards.

- *collaboration*—the teachers meet together by grade level three times a year to discuss interventions for struggling students.

When site-based administrators and resource specialists were asked what makes Rio Calaveras successful, the overwhelming response was "the teachers." The teachers are self-reflective and interested in change in order to perfect their teaching.

Assessment at Rio Calaveras is aligned with and guides instruction. Students are assessed frequently to determine whether they are progressing steadily toward achieving the standards. Teachers use assessment to improve instruction and analyze what students have learned and revisit difficult concepts. The school has a Nell Soto Grant that allows parent conferences to take place in the student's home. The

parent conferences usually take place in off-track time, after school, or on Saturday. Teachers are given an hourly stipend, and the times can be arranged at the parents' and teachers' discretion. Parents are encouraged to be involved in their children's education and are assisted in supporting their children's learning. Parental input is encouraged and valued.

Rio Calaveras teachers have high expectations for students, the principal has high expectations for students and staff, and the parents have high expectations for the school.

At Rio Calaveras there is no time wasted, no down time. For example, teachers have determined that quality time is time on task. If they use an extra 5 minutes every time students line up, 27 days a year would be wasted. When Rio Calaveras students are in line, moving to the cafeteria, out to recess, or moving from room to room, they are chanting math facts and verses and enjoy it! ■

Intelligence plus character—that is the goal of true education.

—Martin Luther King, Jr.

Character Education

Character education is a critical component of education and needs to be embedded in the school culture and curriculum. Each day opportunities present themselves to help students understand, appreciate, and internalize elements of positive character traits such as trustworthiness, respect, responsibility, fairness, caring, citizenship, civic virtue, honesty, and personal responsibility.

The Sacramento County Office of Education (SCOE) and the Center for Youth Citizenship will sponsor a statewide conference on Character Education in Sacramento on Wednesday, March 13, 2002. This conference will provide an opportunity for school and district personnel to learn more about character education and to network with others.

Additional character education references and online resources and more information about the Character Education Conference can be obtained from the California Department of Education's Character Education Web site located at www.cde.ca.gov/character/. ■

The Ninth Annual California Family Literacy Conference
Making a Difference: Strength through Partnerships
March 11-12, 2002
The Santa Clara Marriott

FOR MORE INFORMATION, CONTACT:
The WFG Even Start Family Literacy Program at (916) 657-4770
or CDE's Conference Planning Website at www.cpoevents.com